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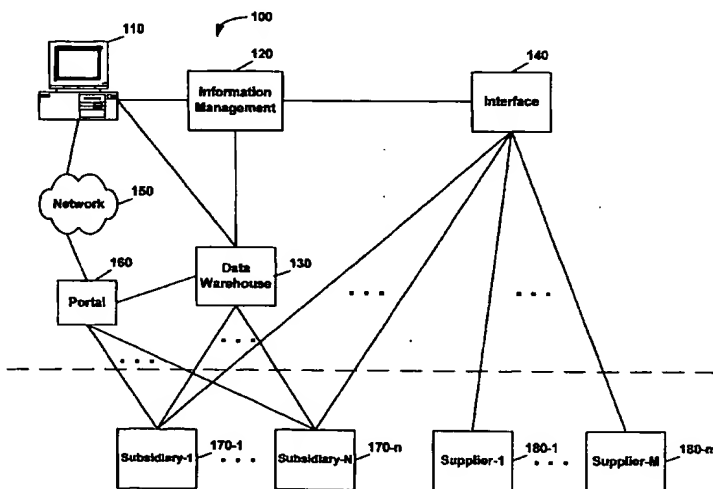
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(54) Title: APPARATUS AND METHOD FOR INTEGRATING VARIABLE SUBSIDIARY INFORMATION WITH MAIN OFFICE INFORMATION IN AN ENTERPRISE SYSTEM



(57) Abstract: The present invention pertains to an enterprise-wide enterprise resource planning (ERP) system (100), and in particular, to methods and systems for interfacing the enterprise-wide ERP system (100) with ERP systems at subsidiary organizations (170). In accordance with an embodiment of the present invention, a method includes connecting to an enterprise data management system through a data base server (522), a web service (524) and a data interface application programming interface (API) (526) in a remote data system (520) and through a data mapping component (532) and an intermediate documents (IDOC) adapter (538) in a data exchange interface (536) using simple object address protocol (SOAP) messages and extensible markup language (XML) messages.

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10 **APPARATUS AND METHOD FOR INTEGRATING VARIABLE
SUBSIDIARY INFORMATION WITH MAIN OFFICE INFORMATION IN AN
ENTERPRISE SYSTEM**

Cross Reference to Related Application

15 [001] This application claims benefit of priority of U. S. Patent
Application Serial Number 60/386,370, filed June 5, 2002.

Field of the Invention

20 [002] The present invention pertains to an enterprise-wide enterprise
resource planning (ERP) management system, and in particular, to methods
and systems for interfacing the enterprise-wide ERP management system
with information systems at subsidiary organizations.

Background

25 [003] In today's large national and multi-national corporations, which
frequently have numerous diverse small and middle-sized business
subsidiaries, data integration between a corporate headquarters ERP
management system and the ERP systems at each subsidiary can be an
almost impossible task. In fact, up to 40% of all small and middle-sized
30 businesses are subsidiaries of large corporations. It is common for
subsidiaries to have implemented different solutions that are not completely
compatible with the solutions at the corporate headquarters. It is also
common for the subsidiaries to have access to fewer information technology

resources than what is available at the corporate headquarters. This may occur for many reasons including: not using centralized planning and control to design the individual systems at each of the locations to be compatible; disparities in computing capabilities between the locations; or a subsidiary
5 being purchased with a different existing information system. In addition, ERP systems at subsidiaries are often by design smaller and less capable, since the subsidiary system does not have the same data processing requirements as at the corporate headquarters.

[004] Because of this system diversity, it can be extremely difficult, time
10 consuming and expensive even to connect to all of the different ERP systems at diverse corporation's locations. In fact, it can be even more difficult, time consuming and expensive to enable all of the locations to be able to coherently share and use the information from each other location. Therefore, it would be desirable to be able to connect, easily and efficiently,
15 a corporate headquarters ERP management system to all subsidiary ERP systems to enable the sharing of the information in each of the separate ERP systems.

Brief Description of the Drawings

20 [005] FIG. 1 is a block diagram of an enterprise-wide integrated ERP management system, in which embodiments of the present invention may be used.

[006] FIG. 2 is a block diagram of the enterprise-wide integrated ERP management system of FIG. 1 illustrating information flow paths used in the
25 generation of an integrated output of information across the enterprise-wide integrated ERP management system, in accordance with an embodiment of the present invention.

[007] FIG. 3 is a block diagram of the enterprise-wide integrated ERP management system of FIG. 1 illustrating information flow paths used in the
30 generation of an integrated output of information to and from subsidiaries distributed in the enterprise-wide integrated ERP management system, in accordance with an embodiment of the present invention.

[008] FIG. 4 is a block diagram of the enterprise-wide integrated ERP management system of FIG. 1 illustrating information flow paths used in the generation of an integrated output of information to and from subsidiaries and/or suppliers distributed in the enterprise-wide integrated ERP management system, in accordance with an embodiment of the present invention.

[009] FIG. 5 is a detailed block diagram showing implementation details in the elements and data flows involved in the data flow illustrated in FIG. 4, in accordance with an embodiment of the present invention.

[0010] FIG. 6 is a detailed block diagram showing implementation details in the elements and data flows involved in the data flow illustrated in FIG. 3, in accordance with an embodiment of the present invention.

[0011] FIG. 7 is a detailed block diagram showing implementation details in the elements and data flows involved in the data flow illustrated in FIG. 2, in accordance with an embodiment of the present invention.

[0012] FIG. 8 is a detailed flow diagram of an integrated scenario method for performing central supply planning in the enterprise-wide integrated ERP management system, for example, between a head office and its subsidiaries, in accordance with an embodiment of the present invention.

Detailed Description

[0013] Embodiments of the present invention provide improved methods and systems for seamlessly interfacing and scaling an enterprise-wide management information system, for example, an enterprise resource planning (ERP) management system at a headquarters location with ERP systems at subsidiary and/or supplier organizations. For example, the functional systems with each ERP may include logistics/supply, human resources, finance and the like. The ERP systems at the subsidiary and supplier organizations frequently are not similar and/or directly compatible with the ERP system at the headquarters location. According to an embodiment of the present invention, an information exchange component may serve to integrate the headquarters ERP system with the subsidiary and/or supplier ERP systems using standardized, predetermined query and

response interfaces and/or a data mapping tool. This information exchange component may also be referred to as an integration server. Thus, a user at a remote location may connect to the ERP using a data base server, a web server and a data interface application programming interface (API) at the remote location through a data mapping component and an intermediate documents (IDOC) adapter in a data exchange interface (XI). To enable this ease of connectivity, the present invention takes advantage of a significant level of information being relatively universal in ERP systems and to provide the standardized, predetermined query and response interfaces with which to facilitate the connection and request for and receipt of information. For example, the interfaces may make use of predetermined formats and/or data mappings to make most user queries from the remote location and to display the results from the queries at the remote location. Therefore, embodiments of the present invention may be easily customized, are easy to implement, and help lower system costs for implementation and maintenance.

[0014] Similarly, according to the embodiment, a supply chain manager at the headquarters ERP system may use the connection to the subsidiary and/or supplier systems to request information. In fact, the supply chain manager may use similar standardized, predetermined query and response interface formats specific to the type and/or source of information being requested from the subsidiary and/or supplier systems and to view the responses at the headquarters ERP system.

[0015] FIG. 1 is a block diagram of an enterprise-wide integrated information management system 100, in which embodiments of the present invention may be used. In FIG. 1, integrated information management system 100 may include one or more user workstations 110, which may be connected to an information management application 120, which may provide access to all data located at a headquarters office, and a data warehouse application 130. For example, in accordance with an embodiment of the present invention, information management application 120 may include a mySAP and/or a SAP R/3 Enterprise Resource Planning (ERP) Solution, both from SAP Aktiengesellschaft of Frankfurt Germany. Information management application 120 may also be connected to data

warehouse application 130 and an interface application 140. Data warehouse application 130 may provide access to consolidated data from subsidiary organizations related to and a headquarter company at which data warehouse application 130 may be resident. Interface application 140 may enable integration of different versions of the same application as well as different applications located at subsidiaries related to the headquarter company and/or suppliers unrelated to the headquarter company.

[0016] For example, in FIG. 1, in accordance with an embodiment of the present invention, data warehouse application 130 may include a mySAP Business Warehouse (BW) and interface application 140 may include an Exchange Infrastructure, both from SAP Aktiengesellschaft. User workstation 110 may be running an Internet browser program, for example, Internet Explorer[®] from Microsoft Corporation and/or Netscape Communicator from Netscape Communications, and may be "logged-on", that is, connected to, a web page (not shown) on a portal 160 via a network 150. A user may logon to the web page by entering a universal resource locator (URL) in an address field of the browser program. In accordance with an embodiment of the present invention, network 150 may be a communications network, such as, for example, an Intranet and/or an Internet, and portal 160 may permit a user at workstation 110 to view information stored in ERP systems distributed at subsidiaries of the headquarters office. Portal 160 also may be connected to data warehouse application 130 and, in accordance with an embodiment of the present invention, may include an Enterprise Portal from SAP Aktiengesellschaft. In accordance with an embodiment of the present invention, user workstation 110, information management application 120, data warehouse application 130, interface application 140, network 150 and portal 160 may all be located at a single site, for example, a company's headquarters location.

[0017] In addition, embodiments of the present invention are contemplated in which the above-listed components may be located at multiple sites, generally, within the headquarter company's location. For example, the components may either be physically closely located, that is,

within the same room or building, or separated, that is, in separate rooms, buildings, etc. within the headquarter company's location. However, it may also be possible to have the system components located in separate locations, for example, different cities, if the company has a decentralized structure.

[0018] In FIG. 1, in accordance with an embodiment of the present invention, interface application 140, network 150 and portal 160 may each be separately connected to one or more remote information management systems at subsidiary-1 . . . subsidiary-N 170-1 . . . 170-n. Each of the remote information management systems located at a regional office and/or a subsidiary company may include, for example, a SAP Business One resource planning solution from SAP Aktiengesellschaft. In general, the data in each subsidiary's remote information management system may also be contained in data warehouse application 130. However, the data in data warehouse application 130 may not be the most current and may not be in exactly the same format as at each subsidiary. For example, the same data may be identified by different field names in a database at each subsidiary, and/or may be stored in fields with different sizes. The use of different field names may occur when existing systems that were not originally developed to be compatible with each other are combined. The different sizes may also result from combining data from two or more fields at one subsidiary that are contained in separate fields at another subsidiary. Therefore, it may be necessary to "map", that is, convert the data from one format to another or to map fields with the same data but different field names when performing data reconciliation/consolidation functions.

[0019] FIG. 2 is a block diagram of the enterprise-wide integrated information management system of FIG. 1 illustrating information flow paths used in the generation of an integrated output of information distributed across the enterprise-wide integrated information management system, in accordance with an embodiment of the present invention. In general, updating the information at data warehouse application 130 may be performed by sending a request for the desired data to one or more of subsidiary-1 . . . subsidiary-N 170-1 . . . 170-n from data warehouse

application 130. The one or more of subsidiary-1 . . . subsidiary-N 170-1 . . . 170-n may each respond by sending the requested data back to data warehouse application 130 where it may be transformed to fit within the data structure resident in data warehouse application 130, if necessary. In FIG. 2, the paths used to enable consolidated reporting within one company, for example, the headquarter company, are illustrated according to the embodiment.

[0020] An example of when a data transformation may occur, in FIG. 2, is during an inventory reconciliation/consolidation between subsidiary-1 170-1 and data warehouse application 130. Specifically, the data base at subsidiary-1 170-1 may have stock items identified by a 20 character field named "Item No.", while the data base at data warehouse application 130 may have stock items identified by an 18-character field named "Material No.". For example, in such a situation the 20-character Item No. may contain the 18 characters contained in the Material No. field in the first 18 characters and a 2-character code in the last 2 characters to identify the specific supplier of that particular item may be contained in the last two characters in the field. Therefore, during a data reconciliation of the data at subsidiary-1 170-1 with the data in data warehouse application 130, each 20-character Item No. from subsidiary-1 170-1 may be mapped to the correct 18 character Material No. at data warehouse application 130. In addition, if tracked at data warehouse application 130, the 2 character supplier code may be stored in an appropriate location in data warehouse application 130, for example, a supplier code field that may be associated with each Material No. in data warehouse application 130.

[0021] Alternatively, the fields may have the same character length but only have different names, which may only require that the fields be mapped to each other during the data reconciliation/consolidation. Likewise, the fields may have the same names but different character lengths, which, in addition to the mapping process, may need the data to be converted/truncated to fit into the available space during the data reconciliation/consolidation.

[0022] In accordance with another embodiment of the present invention, data requests may be sent from at least one of subsidiary-1 . . . subsidiary-N 170-1 . . . 170-n, for example, subsidiary-1 170-1, to data warehouse application 130. In this embodiment, subsidiary-1 170-1 may send (215-1) to data warehouse application 130 an order for a number of a specific supply item. Data warehouse application 130 may identify a source, for example, subsidiary-N 170-n, for the number of the specific supply item and send (210-n) an order to subsidiary-N 170-n to ship the desired number of the specific supply item to subsidiary-1 170-1. Subsidiary-N 170-n may send (215-n) a verification of the order back to data warehouse application 130 which may send (210-1) the notification to subsidiary-1 170-1. Subsidiary-N 170-n may subsequently send (215-n) a notification to data warehouse application 130 that the order has been shipped out, and data warehouse application 130 may send (210-1) the shipping notification to subsidiary-1 170-1. Although, the above embodiment is directed to a simplified, successful scenario for reasons of clarity, numerous other scenarios may exist. For example, the data warehouse application 130 may determine that the requested number of the specific supply item is not available at any of the other subsidiaries, either individually or in combination, and may send a message back to subsidiary-1 170-1 to that effect, whereupon subsidiary-1 170-1 may send back to data warehouse application 130 a cancellation or an order for whatever quantity of the specific supply item is available.

[0023] FIG. 3 is a block diagram of the enterprise-wide integrated information management system of FIG. 1 illustrating information flow paths used in the generation of an integrated output of information from subsidiaries distributed in the enterprise-wide integrated ERP management system, in accordance with an embodiment of the present invention. In FIG. 3, the paths used to enable consolidated reporting across subsidiaries are illustrated.

[0024] In FIG. 3, a user at workstation 110, for example, a supply chain manager in a company's headquarters office, may need to view, in real-time, the current stock on-hand inventory information at his subsidiaries to determine if and where he has the inventory to supply a manufacturing

location. In accordance with embodiments of the present invention, and as described above in relation to FIG. 1, the supply chain manager may logon (310, 325) to a web page application at portal 160 to request information from several sources, for example, data warehouse application 130 and one or more of subsidiary-1 . . . subsidiary-N 170-1 . . . 170-n.

[0025] In FIG. 3, in accordance with an embodiment of the present invention, if the supply chain manager wants to see all of the available inventory at each subsidiary, he or she may send (315-1 . . . 315-N) the request to one or more of subsidiary-1 . . . subsidiary-N 170-1 . . . 170-n from portal 160 to determine the current stock levels. To do this the supply chain manager may access portal 160 using an Internet browser program, for example, Internet Explorer from Microsoft Corporation and/or Netscape from Netscape Communications, to connect to a web page/application running on the portal. Once connected to portal 160, the supply chain manager may request information from one or more of subsidiary-1 . . . subsidiary-N 170-1 . . . 170-n. For example, the supply chain manager may request the information from subsidiary-1 170-1 using one or more predetermined query formats. Each query format may be implemented as a program to retrieve and display pertinent data from internal and/or external company resources on portal 160. Similarly, multiple web pages may be used to contain multiple query formats. For example, internal resources may include one or more of subsidiary-1 . . . subsidiary-N 170-1 . . . 170-n and external resources may include one or more of supplier-1 . . . supplier-M 180-1 . . . 180-M within the web page at portal 160. In general, each of the one or more predetermined query formats may be pre-configured with which of subsidiary-1 . . . subsidiary-N 170-1 . . . 170-n are to receive the request and send (315-1 . . . 315-n) the request to the determined subsidiaries. Each of the receiving subsidiaries may respond to the request by sending (320-1 . . . 320-n) a reply back to portal 160. The predetermined query format selected at portal 160 may either display (325) each subsidiaries response separately or it may consolidate the replies and display (325) the consolidated response in a predetermined response format inside the web page of portal 160. Once displayed, the user at workstation 110 may view the predetermined response

format. According to the embodiment of the present invention, between workstation 110 and portal 160 there may only be web or Internet access of the web page at portal 160 using the URL of the web page. The predetermined response formats may each be implemented as a "sub
5 window" of the web page of portal 160. In general, the predetermined query and response formats are considered permanent and are not subject to change by the user. However, embodiments of the present invention are contemplated in which "editable", that is changeable by the user, versions of the predetermined query and response formats may be available.

10 [0026] A benefit of being able to make this request is that the supply chain manager may receive the most current consolidated inventory information from his or her subsidiaries, which may be more detailed and provide more up-to-date information than what is contained at either information management application 120 and/or data warehouse application
15 130. This, of course, may depend directly on the amount of time that has elapsed since the last time the data at information management application 120 and/or data warehouse application 130 was reconciled with data from subsidiary-1 . . . subsidiary-N 170-1 . . . 170-n.

[0027] In accordance with other embodiments of the present invention,
20 data and/or information requests may be sent to the supply chain manager at workstation 110 from at least one of subsidiary-1 . . . subsidiary-N 170-1 . . . 170-n. For example, subsidiary-1 170-1 may send (320-1) to portal 160 a query for information on a specific supply item. Portal 160 may display (325) the query for the supply chain manager at workstation 110. The supply
25 chain manager at workstation 110 may obtain the information and enter (310) the information into the web page format at portal 160. Portal 160 may send (315-1) the information back to subsidiary-1 170-1. Although, the above embodiment is directed to a simplified, successful scenario for reasons of clarity, numerous other scenarios may exist. For example,
30 scenarios similar to those discussed above for FIG. 2, as well as others described herein, may also be possible.

[0028] FIG. 4 is a block diagram of the enterprise-wide integrated ERP management system of FIG. 1 illustrating information flow paths used in the

generation of an integrated output of information from subsidiaries and/or suppliers distributed in the enterprise-wide integrated ERP management system, in accordance with an embodiment of the present invention. In other words, FIG. 4 illustrates how collaboration across different company
5 borders, for example, the company's' and the suppliers' separate borders between heterogeneous applications may be implemented using interface application 140. Interface application 140 may accomplish this collaboration by integrating different versions of a given application as well as different applications. The integration may be achieved using an open architecture-
10 based interface application 140 with message-oriented communications, for example, hypertext transfer protocol (HTTP) communications using extensible markup language (XML) messages.

[0029] In FIG. 4, in accordance with an embodiment of the present invention, data requests may flow from the subsidiaries up to the corporate
15 headquarters supply chain manager. For example, in an order fulfillment scenario, a salesperson at subsidiary-1 170-1 may create an order (not shown) for a product to be sent to a customer and may send (430-1, 440) the order to information management application 120 via interface application 140. The supply chain manager at workstation 110 may view the
20 order on information management application 120, may ship out (not shown) the ordered product, and may send (415, 420-1) a message indicating that that the product was shipped to the salesperson at subsidiary-1 170-1 from information management application 120 via interface application 140. The salesperson at subsidiary 170-1 may receive the message, generate an
25 invoice to bill the customer and may send the bill out to the customer for payment.

[0030] FIG. 5 is a detailed block diagram showing implementation details in the elements and data flows involved in the data flow illustrated in FIG. 4, in accordance with an embodiment of the present invention. For example,
30 according to the embodiment, in the order fulfillment scenario described above for FIG. 4, in FIG. 5, a salesperson at subsidiary-1 170-1 may connect to a data base management system 520 at subsidiary-1 170-1 to create an order for a product to be sent to a customer. For example, an application

510 may connect to data base management system 520 via a data base server 522 to send the order to information management application 120 via data base management system 520 and interface application 140 where the supply chain manager at workstation 110 may view (410, 445) the order on information management application 120.

[0031] In FIG. 5, in accordance with an embodiment of the present invention, application 510 may connect to data base server 522 by establishing a link with one or more objects in data base server 522. More specifically, application 510 may be used to send (521, 430-1) the order from data base server 522 through a web service component 524 in data base management system 520 using (523) a data interface (DI) application programming interface (API) 526 to interface application 140. More specifically, the order may be sent (521, 430-1) to an Extensible Stylesheet Language Transformations (XSLT) mapping component 532, which may be a part of a routing client 534 in an exchange infrastructure (XI) 536 in interface application 140. According to the embodiment, web service component 524 may enable communication between data base management system 520 and interface component 140 using, for example, simple object access protocol (SOAP) and extensible markup language (XML) messages. XSLT mapping component 532 may perform data mapping functions to ensure the format of the order is compatible with the format of the data in information management application 120, if necessary, and may send (531) the order, either the original or reformatted order, to an intermediate documents (IDOC) adapter 538 within interface application 140. IDOC adapter 538 may be used to connect components (or external systems) to interface application 140 using an IDOC communication format and may send (440) the order to a client application 542 running on an enterprise data base system 544 in information management application 120 where the supply chain manager may access the order from workstation 110 by viewing (410, 445) the order on information management application 120 through enterprise data base system 544. The supply chain manager may ship out (not shown) the ordered product, if available stock levels permit.

[0032] The supply chain manager may also send (415, 420-1) a message back to the salesperson at subsidiary-1 170-1 on whether the product shipped, from information management application 120 via interface application 140. Specifically, the supply chain manager may send (415) the message from enterprise data base system 544 through client application 542 to IDOC adapter 538 in interface application 140. IDOC adapter 538 may send (533) the message to XI system 536, where XSLT mapping component 532 may send (420-1) the message to web service 524 in data base management system 520. Web service 524 may send (523) the message to data base server 522 via data interface API 526, where the message in data base server 522 may be viewed (513, 514) using application 510. The salesperson at subsidiary-1 170-1 may view the message, generate an invoice to bill the customer and send the invoice out for payment and/or to notify the customer that the order was placed, back-ordered and/or shipped.

[0033] FIG. 6 is a detailed block diagram showing implementation details in the elements and data flows involved in the data flow illustrated in FIG. 3, in accordance with an embodiment of the present invention. For example, in accordance with an embodiment of the present invention, in the information request scenario described above for FIG. 3, data and/or information requests may be sent from at least one of subsidiary-1 . . . subsidiary-N 170-1 . . . 170-n, for example, subsidiary-1 170-1, to the supply chain manager at workstation 110. For example, as described above for FIG. 1, in FIG. 6, a user may logon (613, 621, 320-1) to a web page at portal 160 using an application 610, such as an Internet browser program, at subsidiary-1 170-1 and may connect to enterprise portal 160 via a data base server 622 and a web service 624, which may be connected to data base server 622, in a data base management system 620. Application 610 may be used to enter a query for information on a specific supply item in the web page at portal 160 in, for example, a predetermined format available in the web page at portal 160. The query for information may be displayed at portal 160 for a user, for example, a supply chain manager, at workstation 110 to access. Similar to the user of application 610, the supply chain manager at workstation 110

may logon (325, 310) to the web page at portal 160, view (310, 325) the query from the user of application 610, and enter a response to the query in the web page.

[0034] In FIG. 6, the supply chain manager may use workstation 110 to
5 obtain the information requested in the query from an external source, for example, information management application 110, and enter the information in the web page at portal 160. For example, although the FIG. 1 connection to information management application 120 is not shown here for reasons of clarity, in FIG. 6, if the information is not local to workstation 110,
10 the supply chain manager may request the information from information management application 120. Portal 160 may display the information on the web page for application 610 to access (613, 621, 624, 320-1, 315-1, 614) via data base server 622 and/or web service 624. The information may be displayed in the web page in a predetermined output format associated with
15 the predetermined query. Although, the above embodiment is directed to a simplified, successful information request scenario, for reasons of clarity, numerous other scenarios may exist. For example, scenarios similar to those discussed above for FIG. 2, as well as others described herein, may also be possible.

[0035] FIG. 7 is a detailed block diagram showing implementation details
20 in the elements and data flows involved in the data flow illustrated in FIG. 2, in accordance with an embodiment of the present invention. For example, in accordance with an embodiment of the present invention, in the data request scenario described above for FIG. 2, in FIG. 7, data requests may be sent
25 from at least one of subsidiary-1 . . . subsidiary-N 170-1 . . . 170-n, for example, subsidiary-1 170-1, to data warehouse application 130. For example, a user of an application 710 may send (713) a request for data to a data base server 722 in a data base management system 720. Data base server 722 may send (721) the data request to a Java Database
30 Connectivity (JDBC) adapter 724, which may format and send (215-1) the data request to a consolidated data base server 135 in data warehouse application 130. JDBC adapter 724 may use (723) an object server 726 in data base management system 720 to ensure that the format of the request

is compatible with data warehouse application 130. Consolidated data base server 135 may identify the requested data and send (210-1) a response to JDBC adapter 724 in data base management system 720. JDBC adapter may send (723) the response to object server 726 for any re-formatting
5 necessary to be compatible with data base server 722, and object server 726 may send (725) the response to data base server 722. Data base server 722 may send (714) the response to application 710. Although, the above embodiment is directed to a simplified, successful scenario for reasons of clarity, numerous other scenarios may exist. For example, the
10 data warehouse application 130 may determine that the requested number of the specific supply item is not available at any of the other subsidiaries, either individually or in combination, and may send a message back to subsidiary-1 170-1 to that effect, whereupon subsidiary-1 170-1 may send back to data warehouse application 130 a cancellation or an order for
15 whatever quantity of the specific supply item is currently available. In addition, the interface between application 710 and data base management system 720 may be implemented using a browser and web page configuration as described above, for example, in relation to FIG. 1.

[0036] FIG. 8 is a detailed flow diagram of an integration scenario
20 method for performing central supply planning in the enterprise-wide integrated information management system, for example, between a head office and its subsidiaries, in accordance with an embodiment of the present invention. It should be clear that FIG. 8 is merely illustrative of one of the many integration scenarios possible with the systems and methods
25 described herein. As such, the system and methods of the present invention may provide the technical infrastructure and/or basis necessary to build-up any collaborative and/or integrative scenario with distributed business transactions between a head office and its subsidiaries or between suppliers and manufacturers.

30 [0037] In FIG. 8, in accordance with an embodiment of the present invention, a subsidiary and/or supplier sales system 805 may be connected to an exchange interface 810, which may be connected to a central planning system 815 and a central supply system 820 located at, for example, a

company's headquarters office. Subsidiary sales system 805 may transfer (830) historical sales data 832 to central planning system 815 via exchange interface 810 where it may be used to generate (834) a revised demand plan estimate of future sales figures. Demand data 838 from the revised demand plan estimate may be accessed by a user at subsidiary sales system 805, who has logged-on to central planning system 815 via a web service and may be used to change (840) the revised demand plan kept at central planning system 815. Revised demand data 842 from the demand plan may be sent (840) back to central planning system 815 via exchange interface 810 where the revised demand plan may be updated (844). The revised demand plan may be used to generate (846) a central demand plan at the corporate head office. It should be noted that the central demand plan in central planning system 815 may include data from more than just the single subsidiary described above. For example, the entire process may be repeated for each subsidiary and/or supplier connected to the corporate head office before generating (846) the central demand plan.

[0038] In FIG. 8, in accordance with an embodiment of the present invention, subsidiary sales system 805 may also transfer (850) inventory and in-transit data, specifically, stock and stock in-transit data 852, to central planning system 815 via exchange interface 810 where the data can be combined with the central demand plan to perform (848) supply chain planning. As an output of the supply chain planning, a materials list 854 may be sent to central supply system 820 for use in generating (856) individual customer orders, from which sales data 858 may be sent back to subsidiary sales system 805 via exchange interface 810. Materials list 854 may include, but is not limited to, for example, a material item number, a quantity and a need-by/demand date. Sales data 858 may be used by subsidiary sales system 805 to generate (860) a purchase order for items specified in sales data 858. The individual customer orders may also be used to create an outbound delivery advance(d) shipping notice (ASN) confirmation for each order, from which delivery data 864 may be sent to subsidiary sales system 805 via exchange interface 810. Delivery data 864 may be used to create (866) an inbound delivery ASN. The inbound delivery ASN may also

be used to create (868) a goods receipt for the inbound delivery, which, in turn, may be used to create (870) an inbound invoice containing invoice data 872 at subsidiary sales system 805. The inbound invoice and invoice data 872 may be sent to central supply system 820 via exchange interface 810, and central supply system 820 may use invoice data 872 and information from created (862) outbound delivery ASN to create (874) an outbound invoice.

[0039] Several embodiments of the present invention are specifically illustrated and described herein. However, it should be appreciated that modifications and variations of the present invention are covered by the above teachings and come within the purview of the appended claims without departing from the spirit and intended scope of the invention.

What is Claimed is:

1. A method comprising:
connecting to an enterprise data management system through a data
5 base server, a web service and a data interface application programming
interface (API) in a remote data system and through a data mapping
component and an intermediate documents (IDOC) adapter in a data
exchange interface using simple object address protocol (SOAP) messages
and extensible markup language (XML) messages.
10
2. The method of claim 1 wherein connecting through said data
mapping component comprises:
connecting to said enterprise data management system through said
web service to an exchange infrastructure (XI) system, which includes an
15 extensible stylesheet language transformations (XSLT) mapping system to
convert said XML messages into other XML messages, in said data
exchange interface, and said web service to transmit and receive said SOAP
messages to and from said XI, respectively.
- 20 3. The method of claim 2 wherein connecting through said data
mapping component further comprises:
connecting to said enterprise data management system through said
XI system to said IDOC adapter to transmit and receive said XML messages
and other XML messages to and from said enterprise data management
25 system.
4. The method of claim 1 further comprising:
connecting an application program to said web service and said data
interface API through said database server at said remote data system, said
30 application program to transmit and receive said communications from said
enterprise data management system.
5. The method of claim 1 further comprising:

sending a communication to said enterprise data management system through said remote data system and said data exchange interface from an application program connected to said remote data system.

5 6. The method of claim 5 wherein sending said communication comprises:

 sending a data request to said enterprise data management system through said remote data system and said data exchange interface wherein said data request is in a format that is different than how the data is
10 formatted in said enterprise data management system.

 7. The method of claim 6 further comprising:
 receiving a response to said data request through said data exchange interface and said remote data system from said enterprise data
15 management system in said format of said data request.

 8. The method of claim 6 wherein said remote data system is located at a related corporate organization to said enterprise data management system.
20

 9. The method of claim 6 wherein said remote data system is located at an unrelated corporate organization to said enterprise data management system.

25 10. The method of claim 5 further comprising:
 receiving a response at said application program to said communication through said data exchange interface and said remote data system from said enterprise data management system.

30 11. The method of claim 5 wherein sending said communication comprises:

sending a request for data to said enterprise data management system through said remote data system and said data exchange interface from said application program.

5 12. The method of claim 11 further comprising:
 receiving a response to said request for data at said application program through said data exchange interface and said remote data system from said enterprise data management system.

10 13. A machine-readable medium having stored thereon a plurality of executable instructions to perform a method comprising:
 connecting to an enterprise data management system through a data base server, a web service and a data interface application programming interface (API) in a remote data system and through a data mapping
15 component and an intermediate documents (IDOC) adapter in a data exchange interface using simple object address protocol (SOAP) and extensible markup language (XML) messages.

 14. The machine-readable medium of claim 13 wherein connecting
20 to said data mapping component comprises:
 connecting to said enterprise data management system through said web service to an exchange infrastructure (XI) system, which includes an extensible stylesheet language transformations (XSLT) mapping system to convert said XML messages into other XML messages, in said data
25 exchange interface, and said web service to transmit and receive said SOAP messages to and from said XI, respectively.

 15. The machine-readable medium of claim 14 wherein connecting through said data mapping component further comprises:
30 connecting to said enterprise data management system through said XI system to said IDOC adapter to transmit and receive said XML messages and other XML messages to and from said enterprise data management system.

16. The machine-readable medium of claim 13 further comprising:
connecting an application program to said web service and said data
interface API through a database server at said remote site, said application
5 program to transmit and receive said communications from said enterprise
data management system.

17. The machine-readable medium of claim 13 further comprising:
sending a communication to said enterprise data management
10 system through said remote data system and said data exchange interface
from an application program connected to said remote data system.

18. The machine-readable medium of claim 17 wherein sending
said communication comprises:
15 sending a data request to said enterprise data management system
through said remote data system and said data exchange interface wherein
said data request is in a format that is different than how the data is
formatted in said enterprise data management system.

20 19. The machine-readable medium of claim 18 further comprising:
receiving a response to said data request through said data exchange
interface and said remote data system from said enterprise data
management system in said data request format.

25 20. The machine-readable medium of claim 17 further comprising:
receiving a response at said application program to said
communication through said data exchange interface and said remote data
system from said enterprise data management system.

30 21. The machine-readable medium of claim 17 wherein sending
said communication comprises:

sending a request for data to said enterprise data management system through said remote data system and said data exchange interface from said application program.

5 22. The machine-readable medium of claim 21 further comprising:
 receiving a response to said request for data at said application
program through said data exchange interface and said remote data system
from said enterprise data management system.

10 23. A method comprising:
 connecting to an enterprise portal through a data base server and a
web service in a remote data system from an application program external to
said remote data system; and
 requesting information from an enterprise data management system
15 connected to said enterprise portal using a predetermined query format in a
web page on said enterprise portal.

 24. The method of claim 23 wherein connecting to said enterprise
portal comprises:
20 connecting said external application program to said data base
server, which is connected to said web service, and both said data base
server and said web service are connected to said enterprise portal.

 25. The method of claim 23 further comprising:
25 receiving a response to said predetermined query format in a
predetermined response format associated with said predetermined query
format.

 26. The method of claim 25 wherein receiving said response
30 comprises:
 accessing said predetermined response format at said enterprise
portal through said remote data system.

27. The method of claim 25 wherein said predetermined query format comprises:

a program in a web page at said enterprise portal, said program to retrieve specific data from at least one source in an enterprise data management system and display said specific data in said web page.

28. A machine-readable medium having stored thereon a plurality of executable instructions to perform a method comprising:

10 connecting to an enterprise portal through a data base server and a web service in a remote data system from an application program external to said remote data system; and

requesting information from an enterprise data management system connected to said enterprise portal using a predetermined query format in a web page on said enterprise portal.

29. The machine-readable medium of claim 28 wherein connecting to said enterprise portal comprises:

connecting said external application program to said data base server, which is connected to said web service, and both said data base server and said web service are connected to said enterprise portal.

30. The machine-readable medium of claim 28 further comprising:

receiving a response to said predetermined query format in a predetermined response format associated with said predetermined query format.

31. The machine-readable medium of claim 30 wherein sending said communication comprises:

30 accessing said predetermined response format at said enterprise portal through said remote data system.

32. The method of claim 30 wherein said predetermined query format comprises:

a program in a web page at said enterprise portal, said program to retrieve specific data from at least one source in an enterprise data management system and display said specific data in said web page.

33. A method comprising:

connecting to a data warehouse through a data base server and a data base program in a remote data system from an application program external to said remote data system.

34. The method of claim 33 wherein connecting to said data warehouse comprises:

connecting said external application program to said data base server, which is connected to said data base program, and both said data base server and said data base program are connected to said enterprise portal.

35. The method of claim 33 further comprising:

sending a communication to said data warehouse through said remote data system from said external application program.

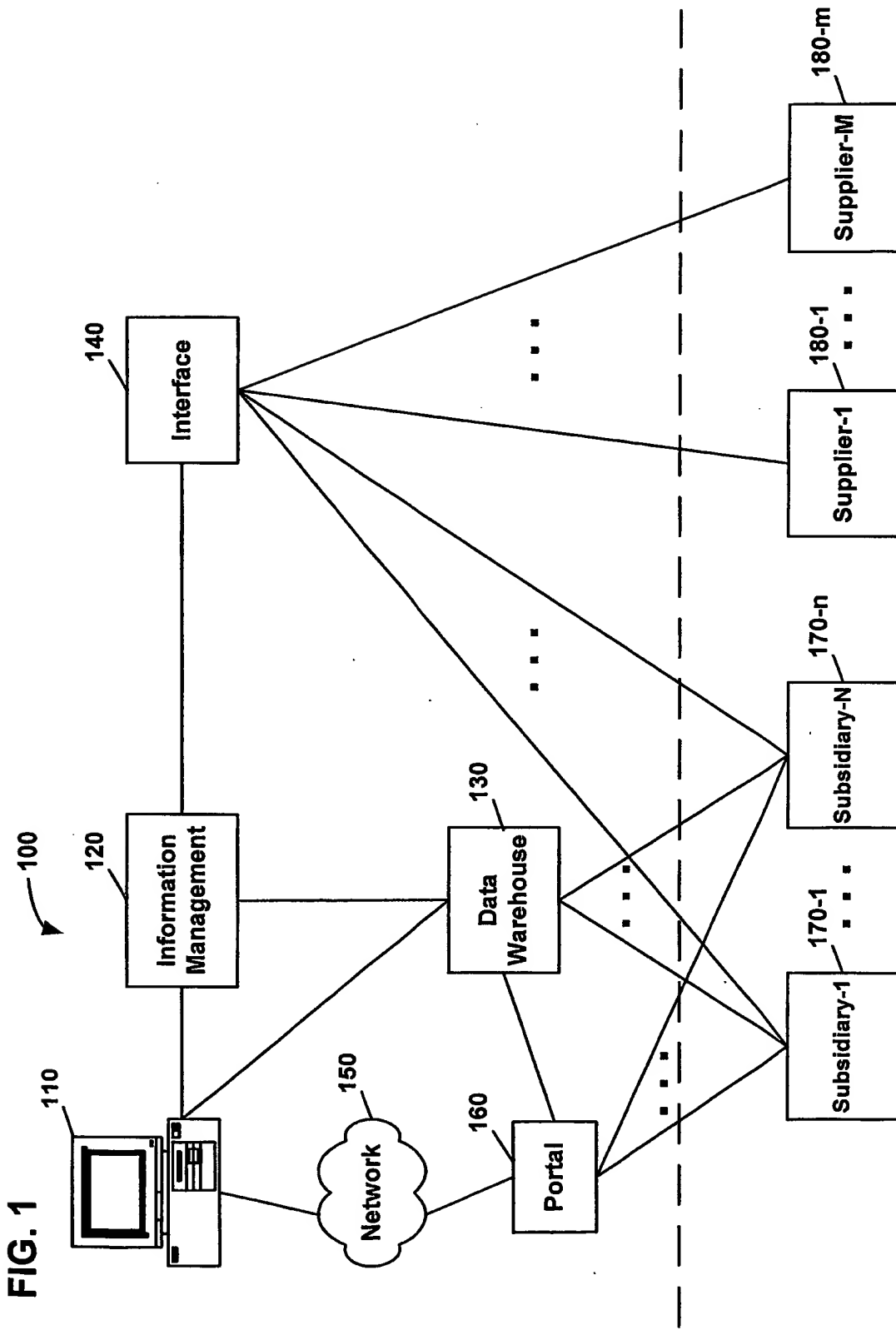
36. The method of claim 35 wherein sending said communication comprises:

sending a data request to said data warehouse through said remote data system.

37. The method of claim 33 further comprising:

connecting said external application program to said data base server, where said data base server is a structured query language (SQL) server.

38. The method of claim 33 further comprising:
connecting said external application program to said data base
server, where said data base server is a structured query language (SQL)
server.



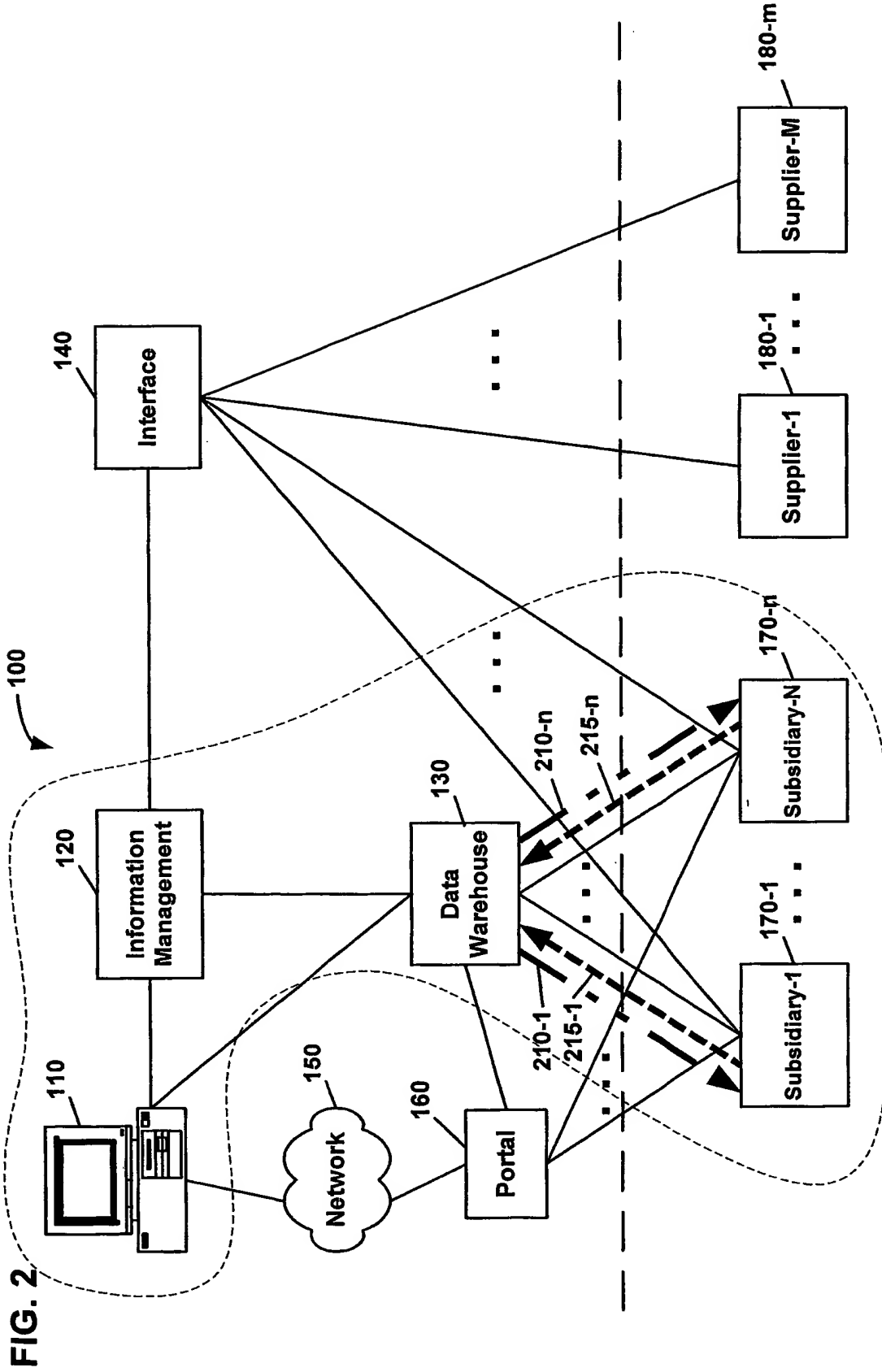
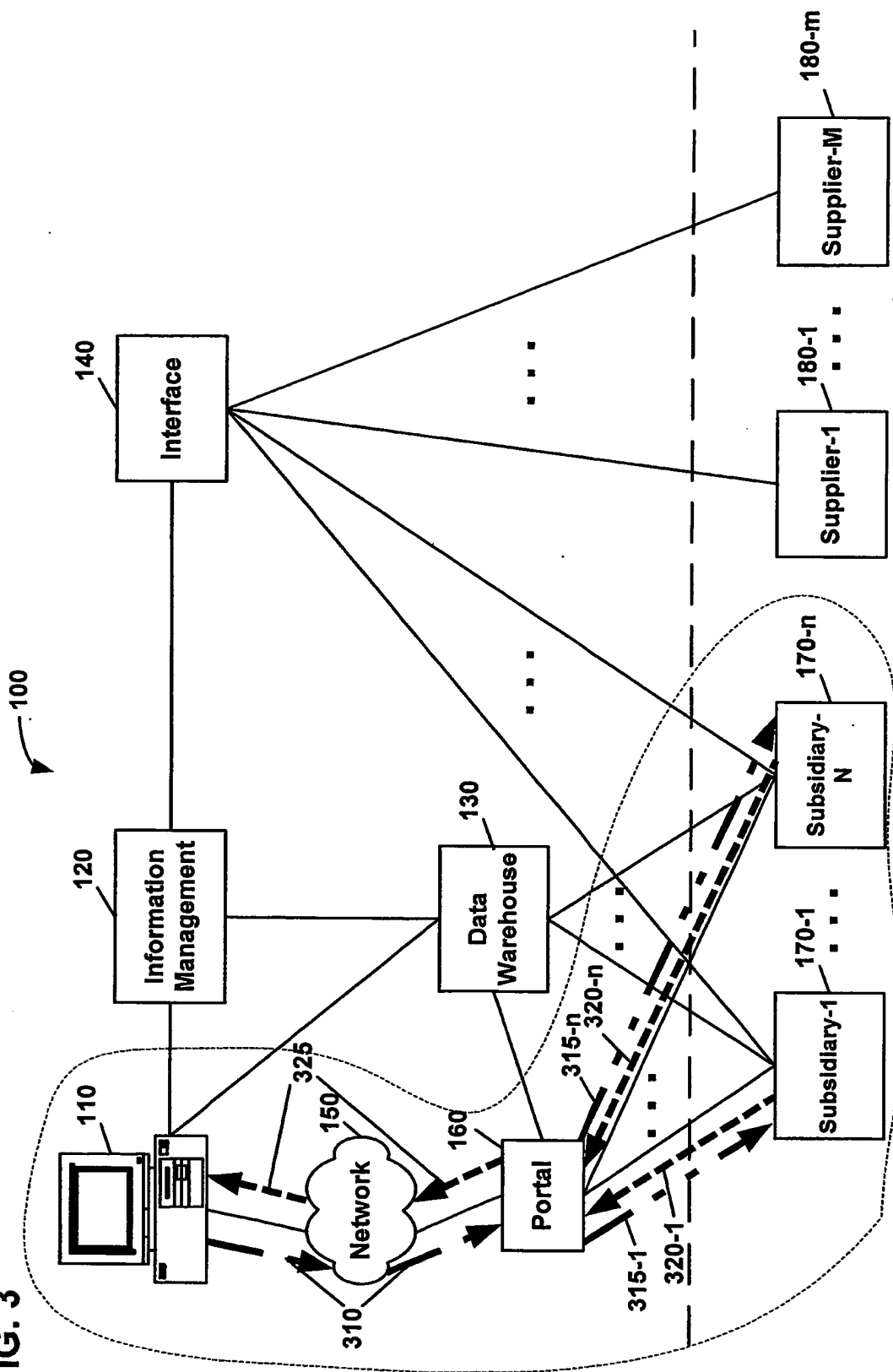
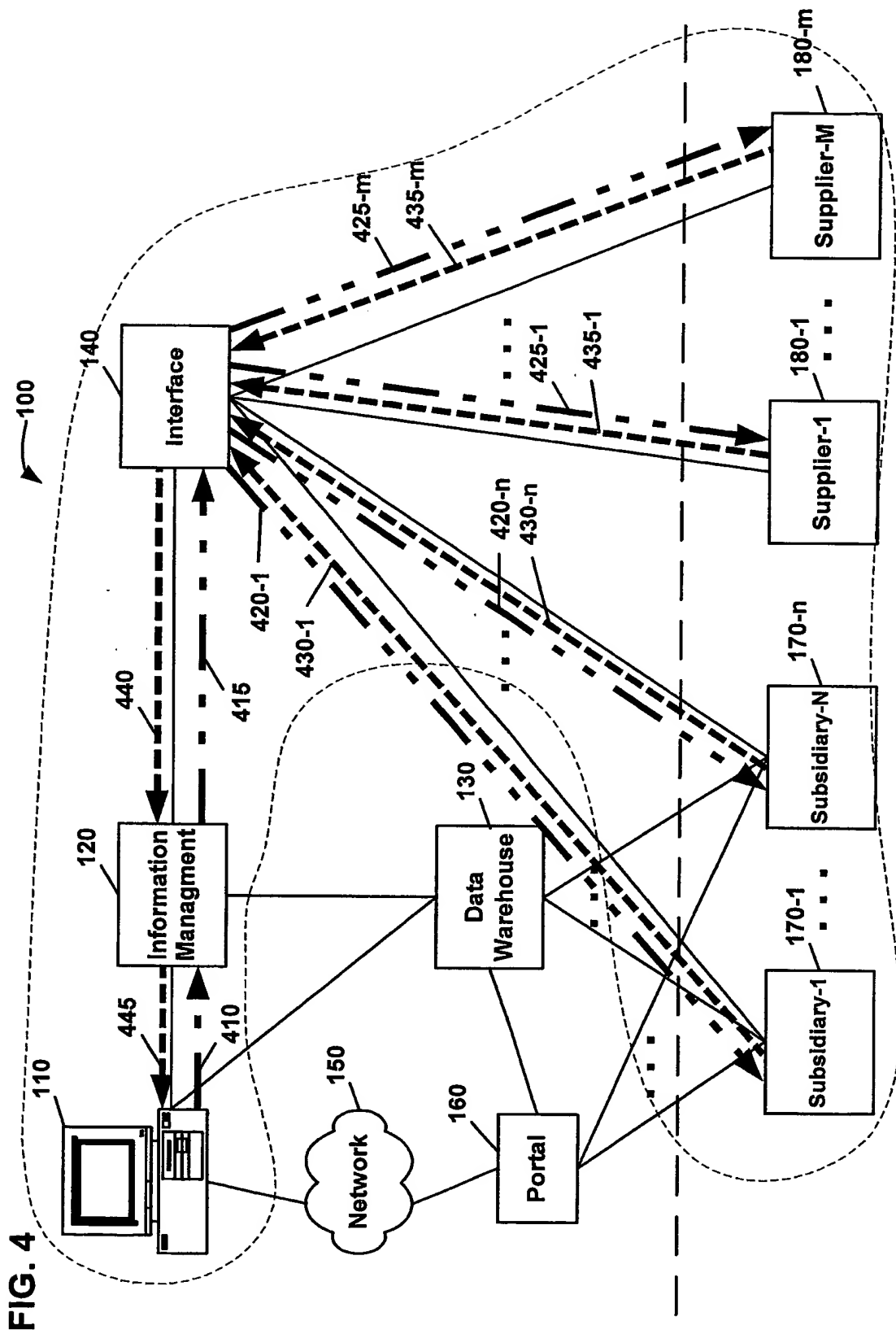


FIG. 3





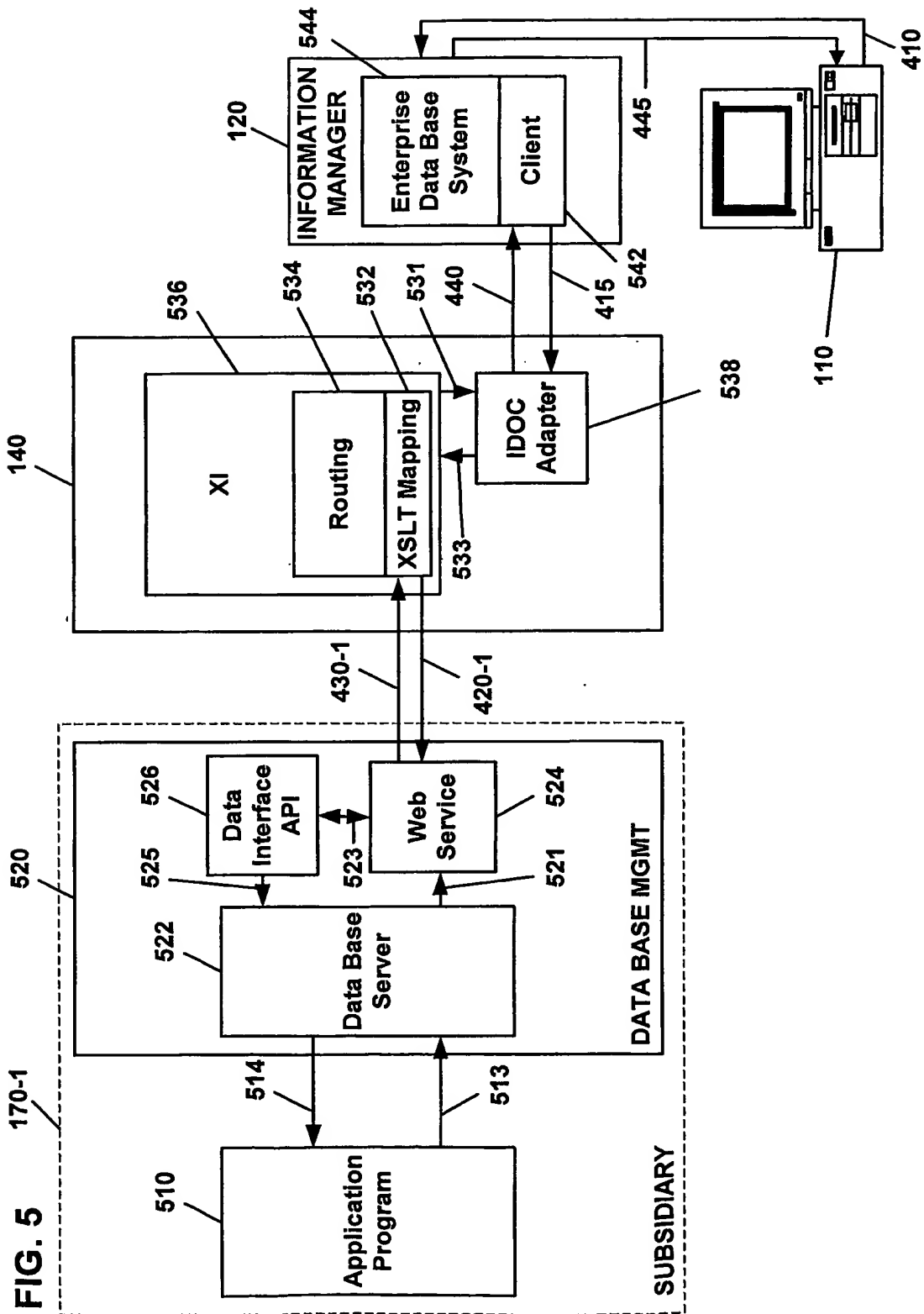


FIG. 6

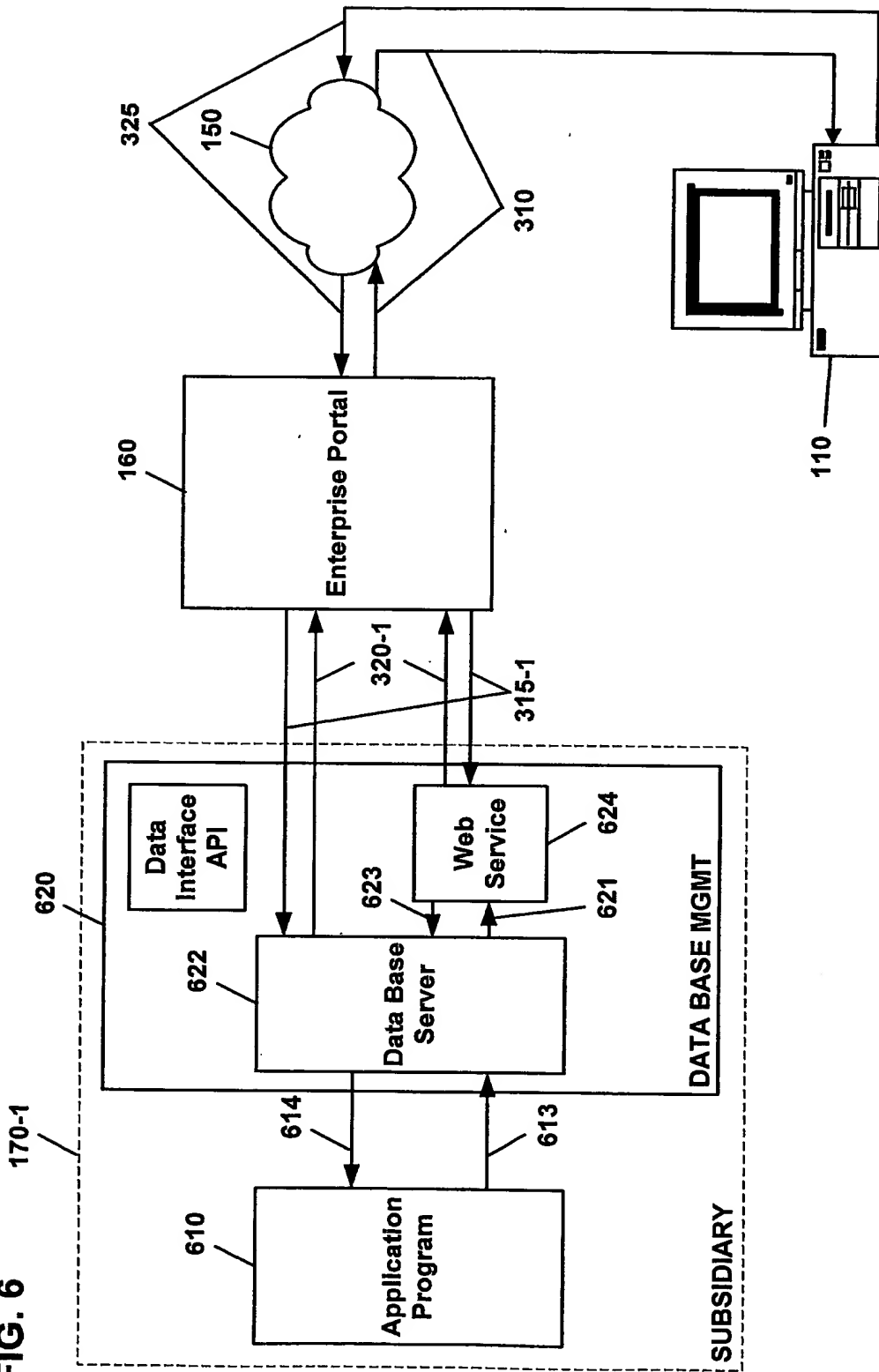
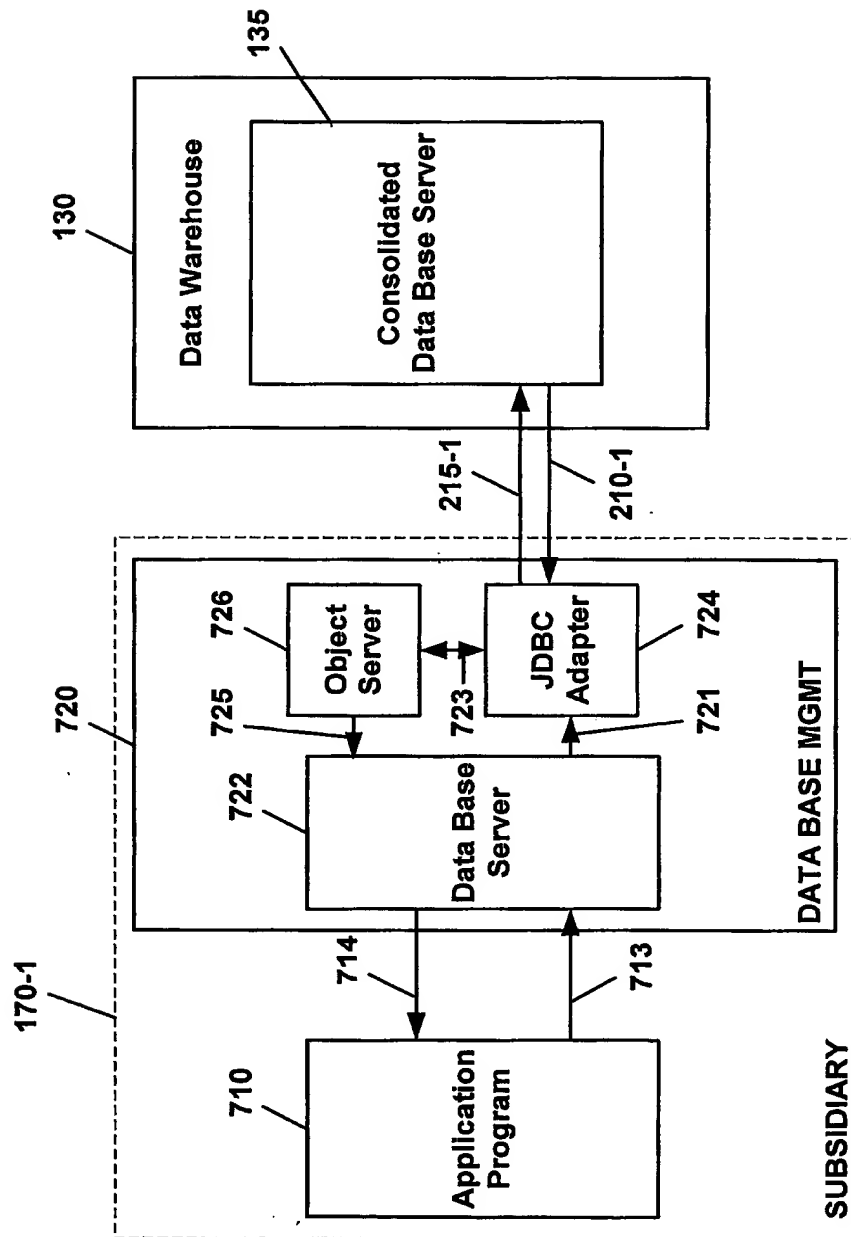
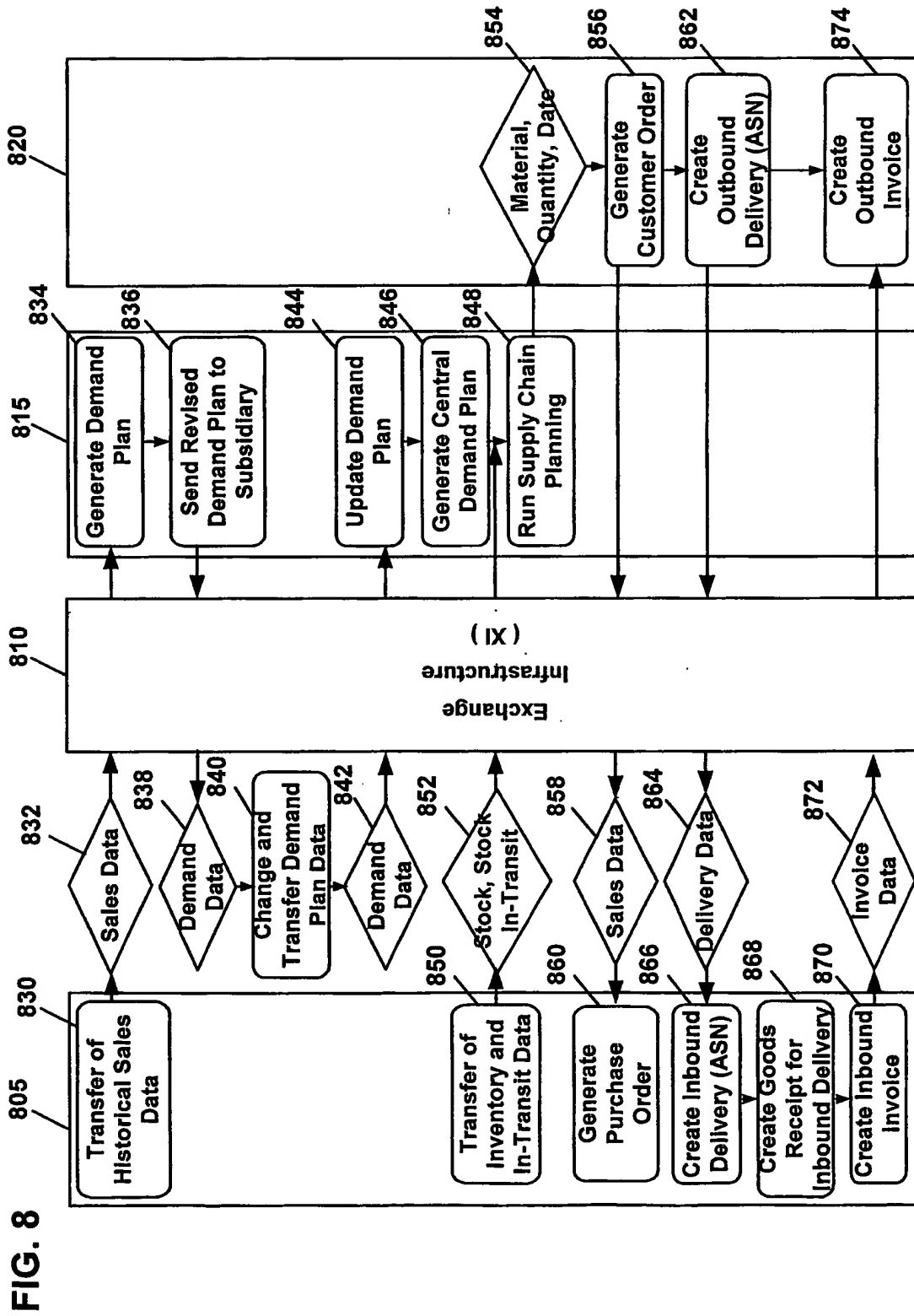


FIG. 7





INTERNATIONAL SEARCH REPORT

International application No.

PCT/US03/17278

A. CLASSIFICATION OF SUBJECT MATTER

IPC(7) : G06F 9/46, 7/30, 17/30

US CL : 709/328; 707/2, 10

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 709/328, 310, 313; 707/2, 10

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A, T	US 6,621,505 B1 (BEAUCHAMP et al.) 16 September 2003 (16.09.2003), the whole document.	1-22
A, P	US 6,546,430 B2 (GRAY, III et al.) 08 April 2003 (08.04.2003), the whole document.	1-22
A	US 6,041,362 A (MEARS et al.) 21 March 2000 (21.03.2000), the whole document.	1-22
X	US 6,334,158 B1 (JENNYE et al.) 25 December 2001 (25.12.2001), the whole document.	23-32
X	US 6,253,282 B1 (GISH) 26 June 2001 (26.06.2001), the whole document.	33-38.

☐ Further documents are listed in the continuation of Box C.

☐ See patent family annex.

* Special categories of cited documents:	
"A" document defining the general state of the art which is not considered to be of particular relevance	"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"E" earlier application or patent published on or after the international filing date	"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"O" document referring to an oral disclosure, use, exhibition or other means	"&" document member of the same patent family
"P" document published prior to the international filing date but later than the priority date claimed	

Date of the actual completion of the international search

17 October 2003 (17.10.2003)

Date of mailing of the international search report

06 NOV 2003

Name and mailing address of the ISA/US

Mail Stop PCT, Attn: ISA/US

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INTERNATIONAL SEARCH REPORT

International application No.

PCT/US03/17278

Box I Observations where certain claims were found unsearchable (Continuation of Item 1 of first sheet)

This international report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claim Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:
2. ☐ Claim Nos.:
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:
3. ☐ Claim Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box II Observations where unity of invention is lacking (Continuation of Item 2 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:
Please See Continuation Sheet

1. ☒ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.
2. ☐ As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:
4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

☐
☒

The additional search fees were accompanied by the applicant's protest.

No protest accompanied the payment of additional search fees.

INTERNATIONAL SEARCH REPORT

PCT/US03/17278

BOX II. OBSERVATIONS WHERE UNITY OF INVENTION IS LACKING

This application contains the following inventions or groups of inventions which are not so linked as to form a single general inventive concept under PCT Rule 13.1. In order for all inventions to be examined, the appropriate additional examination fees must be paid.

Group I, claim(s) 1-22, drawn to *application program interface*.

Group II, claim(s) 23-32, drawn to *remote access*.

Group III, claim(s) 33-38, drawn to *access augmentation*.

The inventions listed as Groups I-III do not relate to a single general inventive concept under PCT Rule 13.1 because, under PCT Rule 13.2, they lack the same or corresponding special technical features for the following reasons:

Inventions I, II, and III are related as subcombinations disclosed as usable together in a single combination. The subcombinations are distinct from each other if they are shown to be separately usable. In the instant case, invention I has separate utility such as *application program interface*, whereas invention II has separate utility such as *remote access*, and invention III has separate utility such as *access augmentation*. See MPEP § 806.05(d).